

Sovereign Hill Education

Separation Process: Golden Past

Teacher's Notes



To be used in conjunction with the Separation Workbook

Contents of Teacher's Notes

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1 How to use the workbook

At school or visiting

The workbook can be used as an accompaniment to a visit to Sovereign Hill, as well as independently in the classroom. The pre-excursion, excursion and post-excursion labels can be used as a guide.

Excursion suggestions

Students will not be able to complete all excursion activities in one visit to Sovereign Hill. Rather you, or preferably your students, should select an area of interest and choose the relevant activity. A Gold Pour demonstration and Red Hill Mine tour are also recommended.

Contents of Workbook

- 1 Pre-excursion activity 1: *Wise Words*
- 2 Pre-excursion activity 2: *Thinking It Through*
- 3 Excursion activity 1: *Alluvial Gold: Down on the Diggings*
- 4 Excursion activity 2: *Deep Lead: Red Hill Mine & Horse-powered Machines*
- 5 Excursion activity 3: *Quartz (reef) Mining Smelting*
- 6 Post-excursion activity 1: *Tick the box*
- 7 Post-excursion activity 2: *Golden words*

Change is good.

The workbook has been written in Microsoft Word© format to allow you to create a workbook suitable for your students. Change the language, activities and instructions to suit your students.

Sovereign Hill Education Service's *Authentic Learning Beyond The Classroom* may give you some ideas on how to allow your students to have greater ownership over their work on excursions.

http://www.sovereignhill.com.au/education/authentic_learning.shtml

Right or wrong

Many of the activities can have a range of answers. If your students can justify them, they should be acceptable. The answers included are where only one answer is possible.

Golden Days

What would you call a beautiful shiny, yellow rock? Geolu, or gold comes from the Old English for yellow. So why do we use the chemical symbol Au? This is from the word aurum, which is Latin for gold.

Gold is an important part of Ballarat's history. Thousands of people flocked to the area to get some of their own gold. The largest nugget ever found in Ballarat was the Welcome Nugget, which was discovered in 1858. It had a mass of 2217 ounces and 16 pennyweight. This is about 69kg. It was sold originally for £10, 500. When these owners resold it, they only got £ 9,325 because the nugget was 22 ounces less than it had originally been. The team of 22 men who found the nugget were rich, but not many diggers got this kind of wealth. Why would they come all the way to Australia on a dangerous voyage, which took several months to try and find some yellow rocks?

Well, the answer really is simple; the chance of getting some gold was enough to lure them. Why is gold so valuable? It is rare and has some very useful properties. It doesn't react readily with chemicals in the air or dissolve in acids, so will do its job for a long time and won't rust or corrode away. Gold is also very soft and so malleable that it can be rolled into a sheet thin enough for light to go through it. It is the most ductile substance, which means it can be stretched into a very thin wire. Gold is a very good conductor of heat and electricity and is often used in electronics! It gives very strong electronic signals as well, so is used in spacecraft and satellites. Did you know there is some in your mobile phone? There is also a lot in your computer. It is still used for teeth, as it won't corrode. The most common use for gold is jewellery, as it will never tarnish.

You may have heard the term 'carat' used with jewellery. No, not the orange things rabbits like! A carat (Ct) is the measure of purity of gold. The highest you get is 24 Ct which means it is 100% pure gold. The problem with this is that it is too soft, and rather heavy, so it is mixed with other metals to make an alloy. Different metals also give different colours. Have a look at the following table to see the different combinations.

Coloured Gold	Alloy metals added to the gold
Yellow Gold	50 % silver 50% copper
White Gold	Nickel, zinc, copper, tin and manganese
Pink (rose) Gold	90% copper 10% silver
Green Gold	High proportion of silver or cadmium
Blue Gold	Some iron
Grey Gold	15-20% iron

18 Ct gold is 75% pure gold. So, if you had an 18 Ct yellow gold ring 75% is gold, 12.5 % is silver, and 12.5% is copper. To work out the percentage of gold in other carat values, you make the value a fraction of 24 eg. 9 Ct = $\frac{9}{24}$ x 100 = 37.5 % gold. Can you work out what percentage would be copper if you had a 12 Ct pink gold ring?

The only thing left to know is how they separate the gold in the first place. For the answer to that, you have to do the rest of the activities!!!

**3 Excursion Activity 3: Quartz (Reef) Mining,
Smelting & Steam-powered Machines
answers.**

Answers
Gold bearing quartz is blasted or dug out and put in trolleys
Trolleys are taken to battery
Gold-bearing quartz is crushed under the Stamper
Gold and sand is washed over copper plates coated with mercury where the free gold creates an amalgam with the mercury
Gold which is still combined is washed over a corduroy blanket and caught here
Left overs are washed over a Wilfrey Table, which is shaken, separating tailings from remaining gold-bearing quartz pieces
Blanket sand and Wilfrey Table quartz are put into the Iron Berdan Pan. An iron ball crushes the minerals and mercury is poured in to make an amalgam with freed gold
Amalgam is put into a chamois where the excess mercury is squeezed free
Amalgam is put into a retort and heated, so the mercury evaporates. The evaporated mercury goes through a condenser into water where it solidifies and is collected for reuse
Impure gold is put into a crucible with flux and heated. The impurities go to the surface and are drawn off

**4 Post-excursion Activity 2:
Golden Words answers.**

TINELFIGR	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>3</div>	Filtering
TYRTABE	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>2</div>	Battery
NODLATIITIS	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>19</div> <div>6</div> <div>14</div>	Distillation
NEENOSDRG	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>15</div> <div>8</div>	Condenser
VIOPEARAOTN	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>10</div> <div>17</div>	Evaporation
MALGAAM	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>18</div> <div>16</div>	Amalgam
TEGCAINDN	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>5</div>	Decanting
LACDER	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>4</div>	Cradle
FITGINS	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>12</div> <div>7</div>	Sifting
LNSADWIS	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>1</div>	Windlass
CYDURROO KLTEABN	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>13</div> <div>11</div> <div>9</div>	Corduroy blanket
SATPERM	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Stamper

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

W E L L D O N E ! Y O U F O U N D G O L D !

5 Websites

Many of the activities can have a variety of answers. Go to the links for background information on these activities. Some sites have other information you may find useful in teaching this topic.

http://www.sovereignhill.com.au/education/notes_sec_mining.shtml

This explains some of the mining technology on the goldfields.

<http://www.sovereignhill.com.au/education/drawings.shtml>

This page has diagrams of the technology used on the goldfields. The name of the drawing appears at the end of the web address.

<http://www.sbs.com.au/gold/story.html?storyid=119>

Again this goes through technology on the goldfields. It also has an interactive feature at the bottom of this page showing different patents.

<http://www.slv.vic.gov.au/slv/exhibitions/goldfields/techniq/techniq.htm>

State Library of Victoria site. Artwork from S.T. Gill showing different mining techniques with descriptions.

<http://www.eduweb.vic.gov.au/sofweb/science/sampleprogram/MIDDLE/modsm/mixit/index.htm>

For teachers. A unit on separation processes which you could integrate into a visit to Sovereign Hill. Includes other websites.

<http://www.sovereignhill.com.au/education/resources.shtml>

This has links to other sites and a bibliography for Primary schools.

